Fuels from Sunlight

The Joint Center for Artificial Photosynthesis

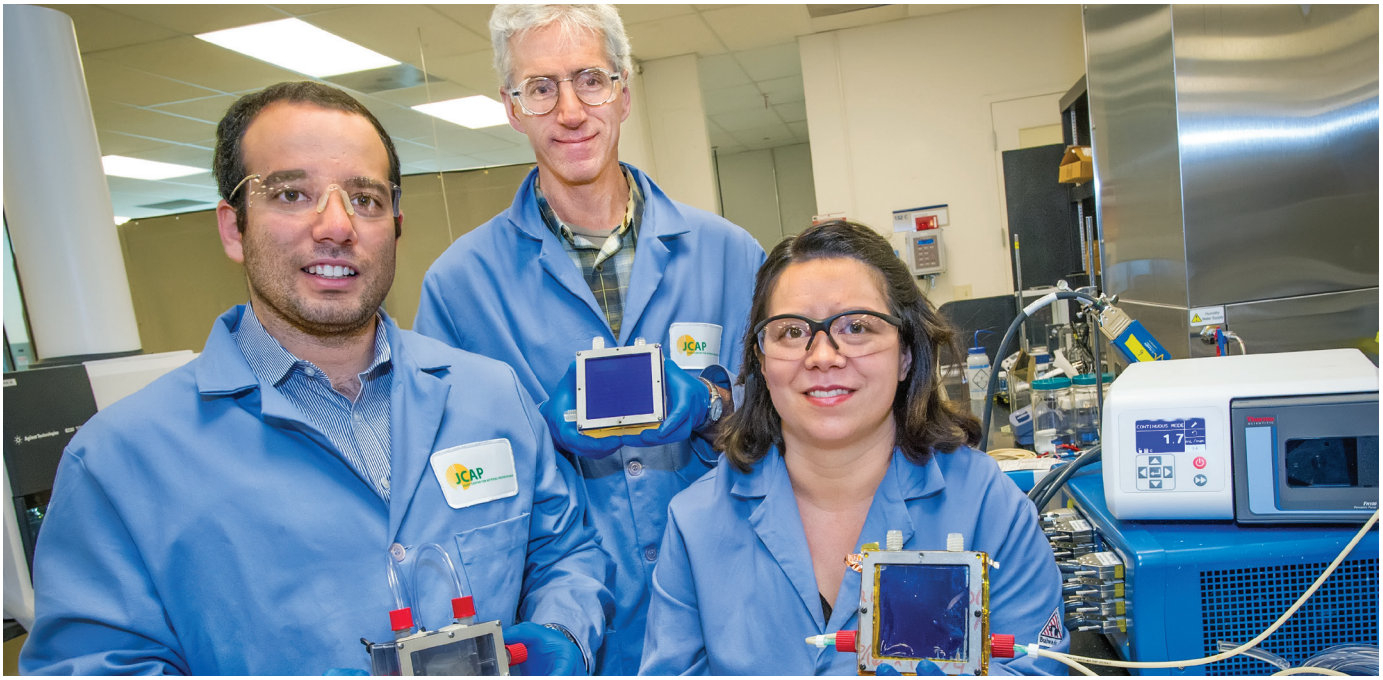
Imagine if we could mimic the elegant photochemistry of a leaf and improve upon it to develop a renewable fuel source to meet the nation's energy demand while reducing carbon dioxide.

More than 140 scientists at the Joint Center for Artificial Photosynthesis (JCAP) — an Energy Innovation Hub of the U.S. Department of Energy led by the California Institute of Technology and its major partner Berkley Lab — are developing a solar fuels generator that will 1) use only sunlight, water, and carbon dioxide; 2) convert sunlight into storable fuels at ten times the efficiency of natural photosynthesis; and 3) be commercially practical and simple to manufacture. JCAP is now entering its fourth year of a five year award of $122 million from DOE.

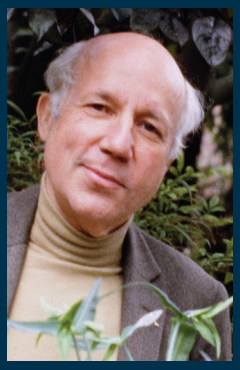
Caltech's and Berkeley Lab's other partners in JCAP include the SLAC National Accelerator Laboratory and the University of California campuses in Irvine and San Diego.

A Recent Scientific Advance: The First Fully Integrated Microfluidic Test-bed

In order to create commercially successful artificial photosynthesis technologies, JCAP researchers must first find ways to efficiently convert solar energy into fuels on a massive scale. Berkeley Lab scientists working at JCAP-N have helped meet this challenge by developing the first fully integrated microfluidic test-bed that evaluates solar-driven, fuel energy conversion systems. Virtually any chemical component with photoelectric properties can be tested in this manner. The JCAP-N test-bed is believed to be the first of its kind to include all of the necessary components for a commercial operation.



Miguel Modestino, Joel Ager, and Rachel Segalman were part of the team that demonstrated the first fully integrated microfluidic test-bed for evaluating and optimizing solar-driven electrochemical energy conversion systems.



A Nobel Challenge

Fifty years ago, Berkeley Lab scientist Melvin Calvin won the Nobel Prize in Chemistry for his work describing a key pathway of natural photosynthesis. The "Calvin Cycle" — how carbon enters a plant cell as CO_2 and departs as a sugar — is now a staple of college chemistry classes. In a 1982 address, Calvin challenged the scientific community to engineer an imitation of this astonishing process: "It's time to build an actual artificial photosynthetic system, to learn what works and what doesn't work, and thereby set the stage for making it work better." Three decades later, JCAP is answering the call.

For more details and the latest news, visit **www.solarfuelshub.org**.

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